CEBAF EXPERIMENT 91-024

Search for "Missing" Resonances in the Electroproduction of Omega Mesons

V. Burkert, H. Funsten, D.M. Manley, B. Mecking, Spokespersons

Electroproduction of ω mesons via the $ep \rightarrow ep\pi^+\pi^-X$ reaction will be used at CEBAF to search for a group of "missing" N^* resonances not observed in πN scattering and predicted to lie in the mass region between ω production threshold and 2.2 GeV. The two-pion background contribution underneath the ω peak in the missing mass spectrum is eliminated by requiring detection of the $\pi^+\pi^-$ pair.

The ω*N* decay channel is well suited to search for "missing" resonances because of the narrow 9-MeV ω decay width. It is sensitive to these resonances because the isoscalar ω can couple with the proton only to $I = 1/2$ resonances and the quark-model predictions by Koniuk [1] and Isgur [2] show that the ωN decay of these resonances should be generally as strong as their other decays. Decay by the π*N* channel is predicted to be weak.

Two nonresonant processes *t* channel π exchange and vector-meson-dominated diffraction, are strong and could easily mask a resonance signal, particularly at forward angles. The differential cross section was calculated taking into account these two processes and a $N^*(1955)5/2^+$ "missing" resonance, predicted to have strong γ N and ω N couplings and an almost vanishing π*N* coupling.[1, 2] The calculation showed that backward ω production is dominated by the resonance contribution.

Data for ω production in the resonance region are sparse. In the ω electroproduction data of Joos *et al.*.[3] at W ≈ 1.9 GeV, $0.3 < -Q^2 < 1.4$ (GeV)^2, there is evidence of a leveling off of the differential cross section at backward angles, which is suggestive of resonance production. A similar indication for resonance production appears in the ω photoproduction data of the ABBHHM[4] collaboration at $W \approx 2.2$ GeV. Our cross section calculation agrees with the $W \approx 2.0$ GeV photoproduction data over all angles, indicating the possibility of resonance(s) with an ω *N* decay. In the previous experiments no attempt was made to study a resonance-induced variation of the backward-angle cross section with *W*.

The angular correlation of the ω-decay plane was also calculated. The results indicate a strong resonance signal even in the presence of appreciable π exchange and diffraction at nonforward scattering angles.

[

1 R. Koniuk and N. Igur, Phys. Rev. **D21**, 1868 (1980).
2 N. Isgur and G. Karl, Phys. Rev. **D19**, 2653 (1979).
3 P. Joos et al. Nucl. Phys. **B122**, 365 (1977)
4 ABBHHM Collaboration, Phys. Rev. **175**, 1669 (1968).